NICE^3 Technical Periodic Report #7

1. Title / State / Company

Precision Irrigation Technologies for the Agricultural Industry
Colorado Office of Energy Management and Conservation
Colorado Corn Administrative Committee

2. Periodic Activity Summary - In a narrative format, briefly describe the technical progress for the period.

Crops were planted at both the Yuma and Wiggins sites, and field scouting of management zones is ongoing. Soil samples have been taken, well tests have been conducted, and gypsum blocks have been set at both sites. The two tests for ground application have been completed. We encountered some technical difficulties with operating the AccuPulse Systems, however repairs are underway. Planned tests for AccuPulse and aerial applications will be an important component of the field assessment and evaluation for 2002. The website and brochures are complete, and the multimedia kiosk is near completion.

3. Milestone Table

a) Describe technical progress for the period, with ongoing activities and discuss the actions taken to meet the milestone deadlines.

The corn was planted at the Yuma site on April 18th. Servitech has been making weekly visits to do intensive scouting of the management zones for weeds, insects, and crop health. The soil fertility maps for the Wiggins site were complete around the first of April and the fertilizer was applied with a ground rig at variable rates as needed across the field. The potatoes at the Wiggins site were planted in mid-April and Servitech started weekly checks on May 3rd.

Y-W Well Testing has taken soil samples from all of the fields, six per site, one foot through six foot at 12 different sites. We have also tested both irrigation wells for gallons, draw down, and efficiency. The soil moisture blocks have been set in all three sites, with four sets of gypsum blocks for each site.

USDA-ARS finalized sampling plans for using water sensitive paper to compare uniformity of coverage for AccuPulse, aerial, and ground application methods. Two tests were run for the ground application method. We are waiting for the producers to use the AccuPulse Systems and do aerial spraying so the remaining uniformity tests can be done.

USDA-ARS has also developed a preliminary experimental plan for assessing fungicide residue levels on the potato plants for the three application methods, but we haven't determined whether the required chemical analyses are affordable and whether field access will be restricted because of disease concerns.

The website is finished and accessible at http://coloradocorn.com/precisionirrigation The Colorado Corn Growers will maintain the site once the grant is completed. The News page remains empty while the team prepares input. The Precision Irrigation brochures were printed and have been delivered to Colorado Corn. We printed 10,000 brochures. The Power Point Presentation for the multimedia kiosk is complete. The presentation will vary by audience to some degree. Valmont recently contributed some slides that will be incorporated shortly. The display board is at the imaging firm. The display was created to fit the Colorado Corn display board and highlights irrigation and application challenges and the benefits of precision farming technologies.

b) Provide an explanation of technical difficulties encountered while testing, installing, or operating the system.

The AccuPulse System at the Yuma site did not work properly this spring. The pressure switch box on the #2 tower had been replaced last fall because one of the pressure switches in that box had frozen the winter before allowing chemical to spray into the box. This caused the box to corrode and require replacement. When the producer started the AccuPulse System this spring it would operate fine but the system safety would drop out.

After trouble-shooting, we found the signal from the #2 and #3 pressure switches was not returning to the #1 and #4 PLC boxes. The problem turned out to be a wire that had corroded completely apart inside the insulation on that #2 tower, making it rather hard to track down. This wire should feed power from #2 power supply to the two pressure switches then return to the proper PLC box to signal the pressure fluctuations as sections #2 and #3 pulse. There were 5 accumulators on the system that the hose barbs had broken off of. We believe this is caused by the connecting tubes shrinking during extreme cold.

At the Wiggins site, the AccuPulse System started and began to function properly, however when we were reprogramming the PLC's for the 1st 3 towers we lost all power. It was necessary to reprogram because the center pivot center-drives had been changed to a different rpm, which affects the timing of the pulses.

We feel there are going to be problems with the support cables in areas such as Wiggins where the water is quite corrosive. The AccuPulse System control boxes will also tend to corrode due to the mount location under the umbrella of the water application nozzles. The Yuma system does not show any corrosion like the Wiggins system.

The plan was to use the AccuPulse System at the Yuma site to apply the pre-emerge herbicide, but the system wasn't working properly. Because the AccuPulse system at the Yuma site was not working properly when the pre-plant herbicide was applied this spring, we were not able to use the water-sensitive cards to assess the uniformity of application.

With the potato crop at the Wiggins site, the producer wanted to limit foot traffic in the field, which complicated the setting of gypsum blocks.

c) Explain the steps taken to resolve these difficulties.

Valmont has a newer accumulator with more integrity in the hose barb area to overcome the shrinking problem. We are working with Valmont to update both of the AccuPulse Systems to the new style accumulator.

The herbicide at the Yuma site was applied with a ground rig. We are working on getting the AccuPulse system at the Yuma site to function properly so the tests can be done when the producer next applies the chemicals.

We installed a Pivot Rider from Agri-Inject on the Wiggins AccuPulse System this June. This Pivot Rider will allow us to inject chemical into the end gun to allow application of chemical beyond the reach of the AccuPulse System.

The AccuPulse System at the Wiggins site will be repaired in mid-June as the sprinkler will not be watering at that time.

At the Wiggins site, Y-W Well Testing installed the soil moisture blocks in locations that could be accessed by walking in the sprinkler tracks instead of down the rows.

d) Describe any known or potential changes in milestone dates.

N/A

e) Address activities and planned accomplishments for the upcoming quarter.

USDA-ARS plans to collect at least three datasets for determining coverage uniformity during the growing season as well as multiple sampling for fungicide residue in the plant canopy of potatoes. We plan to do the sample preparation ourselves and will have the chemical analysis done by a commercial lab with gas chromatography equipment.

Y-W Well Testing will continue to take weekly readings of the moisture blocks, create a computer spreadsheets of the results, and test the irrigation wells for efficiency and water levels.

We are working with Colorado State University to incorporate information about this project into a video they are creating about precision farming. Partnering with Colorado State University will ensure the video can be completed within budget. If that is not an option, we are exploring adding a video component to the PowerPoint presentation and multimedia kiosk.

4. Discuss results (testing etc.) and their implications to the project. Discuss any necessary or anticipated milestone additions or deletions.

In scouting at the Yuma site, Servitech discovered that there is a lot more Kochia (weed) across one of the low productivity zones compared to the others. We discussed this with the producer to see if he wanted to treat that area with the AccuPulse System. At this point nothing has been decided. In scouting between management zones at the Wiggins site Servitech has observed that

the potato stand is a little lighter in the low productivity zone. We anticipate learning more when the aerial photos start coming in around the beginning of July.

Preliminary results from field sampling and testing by Y-W Well Testing are showing there is an opportunity to save water and energy by utilizing precision irrigation technologies. The soil tests show that fertilizer costs could be cut through targeted and more accurate application with a system such as the AccuPulse System.

The comparison of three application methods for uniformity of coverage and amount of chemical residue on the plants, which will occur after this growing season, will be an important finding of this project to help commercialize the AccuPulse System.

5. Attach publications written that relate to the project (internally or externally produced). List any planned publications or conferences to be attended related to the project for the next quarter.

Please see the attached grid sample results and fertility maps from Servitech and soil sample and well test results from YW Well Testing Association. Also attached are copies of the brochure, the display board, and the power point presentation prepared by Foster Communications.

At least two staff members from USDA-ARS will attend the annual American Society of Agricultural Engineers meeting in July 2002.

Y-W Well Testing gave a presentation at a Tri-State Generation meeting. We also installed gypsum blocks for the Irrigation Research Farm. A USDA-ARS/Colorado State University Focus Group meeting is planned in July.

6. Discuss any key personnel changes.

N/A

7. Discuss any cost-sharing partner/demonstration partner changes.

N/A

8. Discuss any other topics that are relevant to the scope and progress of the project.

N/A